Electronic Services - Los Angeles
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Instruction Manual
21-205

Heavy Duty Series I Megger®
Insulation Testers

GENERAL ELECTRIC
12470 KONA DRIVE
542 5317

James G. Biddle Co.
PLYMOUTH MEETING, PA. 19462

Instruction Manual
21-20J

Heavy Duty Series I Megger®
Insulation Testers

Please Read Section "B" - Safety Precautions and Other Instructions Before Using This Test Set!

A member of the Thorn Group THORN

James G. Biddle Co.

PLYMOUTH MEETING, PA. 19462

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Section A

INTRODUCTION

The Heavy Duty Series 1 Megger instruments are available in two voltage models, 2500 Volts, and 5000 Volts, with additional "dash" varieties depending on the input voltages as follows:

Cat. No.	Input & Frequency Voltage	Output Voltage	Megohm Sensitivity
218638	100-120V, 50/60Hz	500	50,000
218638-2	210-250V, 50/60Hz	1000	100,000
		1500	150,000
		2000	200,000
		2500	250,000
218640	100-120V, 50/60Hz	1000	100,000
218640-2	210-250V, 50/60Hz	2000	200,000
		3000	300,000
		4000	400,000
		5000	500,000

All Heavy Duty Series 1 Megger insulation testers have been designed so that the generator may be operated either by a hand crank or by an internal motor. The hand crank is automatically disengaged when operating in the Motor-Drive mode.

All instruments have very high stability with the output voltage not varying by more than 0.1% at full scale.

All instruments are of the same physical size and weight. Each is assembled into a teakwood case with a hinged lift-off cover in which an instruction card is mounted.

The case rests on three leveling feet which should be adjusted before use for the most accurate readings.

Section B

SAFETY PRECAUTIONS

WARNING - HIGH VOLTAGE! SAFETY IS THE RESPONSIBILITY OF THE USER!

The Test Set and sample to which it is connected are a source of high voltage electrical energy and all persons making or assisting in the tests must use all practical safety precautions to prevent contact with energized parts of the test equipment and related circuits. Because of the hazards associated with any high voltage testing it should only be performed by properly qualified personnel.

Persons actually engaged in the test must stand clear of all parts of the complete high voltage circuit unless the set is de-energized and all parts of the test circuit are grounded. Any persons not directly involved with the work must be kept away from test activities by suitable barriers or warnings.

The output terminals (marked L, Ground, E) are the source of test voltage and should not be touched at any time when the set is switched on or the handle is cranked. Always switch to "Discharge" on the six-position Range Switch before making connections to the terminals.

If the set is properly operated and all grounds correctly made, no rubber gloves are necessary. As a routine safety procedure, some users require the use of rubber gloves not only in making connections to the high voltage terminals but in manipulating the controls. The James G. Biddle Co. considers this to be an excellent safety practice.

Note that the maximum current which can be drawn from the test set is 2.5mA dc; however, large currents may be available from the energy stored in the capacitance of the sample under test.

It is essential that such capacitive samples be properly discharged before they are safe to touch. Because of the dielectric absorption of some types of solid dielectric insulation the sample must be short-circuited for a period of time before it is safe to handle. The time the short circuit should be in place varies with different insulating materials. A good "rule of thumb" for many common insulations is at least five times as long as it was energized. If in doubt use longer periods and use a suitable voltage detector before handling. See also Section H "Operation" for an explanation for using the discharge position of the switch.

Some typical objects having built-in capacitance which are commonly tested are: capacitors, cables, machine windings, transformer windings and many other electric circuits and components.

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Section C

RECEIVING INSTRUCTIONS

Your Heavy Duty Megger Insulation Tester has been thoroughly tested and inspected to rigid specifications before being shipped and is ready for use after it is set up as indicated in the Setting-Up section. Check the equipment received against the packing list. Notify James G. Biddle Co., Plymouth Meeting, Pa. of any shortage of materials. The instrument should be examined for damage received in transit. If any damage is found, file a claim with the carrier at once and notify James G. Biddle Co. or its nearest representative giving a detailed description of the damages observed.

Section D

SPECIFICATIONS

Catalog No. 218638 Series

Test Voltage	Inner Scale (MΩI) M: and Infinity	Outer Scale (MΩII) M: and Infinity
2500V	0-500	50-250,000
2000V	0-400	40-200,000
1500V	0-300	30-150,000
1000V	0-200	20-100,000
500V	0-100	10- 50,000

SHORT CIRCUIT TERMINAL CURRENT:
The maximum on all ranges is 2.5 mA dc.

TERMINAL VOLTAGE AT INFINITY:
±3% of rated voltage.

ACCURACY:
±0.03 in. (±0.76 mm)

SCALE LENGTH:
4.4 in. (112 mm)

CLUTCH SLIPPING SPEED:
160 rpm of generator handle speed, (approximate)

DIMENSIONS: (Overall)
Width 14" x height 9½" x depth 11" measured over cover, handle and feet, (355 x 240 x 280mm)

WEIGHT:
27.5 lbs., (12.5kg)

POWER SUPPLY:

Cat. No. 218638	100-120V	50/60 Hz	200 watts
Cat. No. 218638-2	210-250V	50/60 Hz	200 watts

POWER CORD:
3 wire Type SVT 7½ ft. long

STANDARD LEADS SUPPLIED:
None

Section D

SPECIFICATIONS (Cont'd.)

Catalog No. 218640 Series

Test Voltage	Inner Scale (MΩI) MΩ and Infinity	Outer Scale (MΩII) MΩ and Infinity
5000V	0-2500	100-500,000
4000V	0-2000	80-400,000
3000V	0-1500	60-300,000
2000V	0-1000	40-200,000
1000V	0- 500	20-100,000

SHORT-CIRCUIT TERMINAL CURRENT:
The maximum on all ranges is 2.5mA dc

TERMINAL VOLTAGE AT INFINITY:
±3% of rated voltage

ACCURACY:
±0.03 in. (±0.76mm)

SCALE LENGTH:
4.4 in. (112mm)

CLUTCH SLIPPING SPEED:
160 rpm of generator handle speed, (approximate)

DIMENSIONS: (Overall)
Width 14" x height 9½" depth 11" measured over cover, handle and feet, (355 x 240 x 280 mm)

WEIGHT:
27.5 lb. (12.5kg)

POWER SUPPLY:

Cat. No. 218640	100-120V	50/60 Hz	200 watts
Cat. No. 218640-2	210-250V	50/60 Hz	200 watts

POWER CORD:
3 wire Type SVT 7½ ft. long

STANDARD LEADS SUPPLIED:
None

Section E

DESCRIPTION

The Generator used for producing the insulation test voltage comprises a six-pole magnet rotor with a single stator bobbin carrying two windings together with a gear train. The output from one of these windings is connected to a voltage quadrupler and a stabilizer circuit working in conjunction with a constant-speed clutch. This circuit provides the insulation test voltage.

The output from the second winding is also rectified and provides the energizing source for the current amplifier operating in the deflecting circuit of the cross-coil ohmmeter.

A mechanical coupling between the motor and the generator is arranged so that the motor shaft free-wheels when the generator is rotated by hand. Another coupling free-wheels when the motor is driving the generator, thus allowing the hand crank to idle.

The hysteresis drive motor, housed in a separate compartment within the case, is directly coupled to the ac generator. A cooling fan is attached to the shaft.

The voltage quadrupler, stabilizer components and the capacitors for starting and running the motor are grouped on a printed circuit board adjacent to the motor and generator. The control circuit resistors and the deflecting circuit resistors are also contained on a printed circuit board adjacent to the Test Voltage selector switch and the MΩI/MΩII switch. Finally, the amplifier supply and movement shunting circuit is contained on a third printed circuit board.

A cross-coil movement is used, and to increase the instrument sensitivity, a current amplifier is provided. This current amplifier is used in the movement deflecting circuit to increase the meter sensitivity to 50,000 Megohms at 500V for the Cat. No. 218638 instrument and 100,000 Megohms at 1000V for Cat. No. 218640. The amplifier obtains power from a separate winding on the ac generator.

The line cord plugs into a three-pin connector on the panel at the rear of the tester, then to the motor via a fuse and a three-position toggle switch. When the switch is ON a signal lamp on the switch-board is illuminated. The toggle switch incorporates OFF-ON-START positions. The START position has a spring return. With the switch

held at START, additional capacitors are introduced into the motor circuit, raising the torque. The capacitor value employed varies with the type of motor. Once running speed has been attained and on release of the spring loaded start switch, the extra capacitors are switched out of circuit to prevent the motor from overheating.

Selection of the desired test voltage is made by rotating the six-position switch to any of the five voltages available. This switch selects resistors in the control coil circuit of the cross-coil ohmmeter. The sixth position is DISCHARGE. With the switch in this position any charge on the terminals is dissipated within the instrument at the end of a test, rendering the test leads safe for removal from the item under test.

Turning the Range switch from MΩI to position MΩII changes resistors in the amplifier circuit. The meter scale carries two sets of markings to correspond with these switch positions.

MEGGER Testers incorporating cross-coil movements are individually calibrated. Repairs to these instruments should not be attempted unless facilities for re-calibration are available.

The test leads (not supplied)* are connected to the three terminals L, GUARD, and E located in the recessed panel on the end of the instrument case. The Earth or Ground lead is a plain flexible lead terminating with a spade connector at one end and a well-insulated crocodile clip at the other end.

the LINE lead is of special high-voltage construction with shielding along its entire length. The center conductor connects with a spade connector at one end and a crocodile clip at the other. A short pigtail lead is connected to the inboard end of the shielding. With the LINE lead connected to the L terminal and the pigtail lead connected to the GUARD terminal, any stray leakage currents are returned to the instrument voltage source without influencing the resistance reading.

*Available from Biddle. See Accessories, SECTION L.

Section F

CONTROLS AND CONNECTOR IDENTIFICATION

CONTROLS

There are two rotary switch controls on the panel. The control adjacent to the meter is the two-position Scale Selector switch, Fig. 4 (1). The control immediately below is the six-position Range Selector switch, Fig. 4 (2).

The Scale selector has two positions MΩI and MΩII. Position MΩI corresponds to the inner scale of the meter dial and is selected when readings are being made on the low range scale, Fig. 4 (3).

Position MΩII corresponds to the outer scale of the dial and is selected when readings are being made using the high range scale, Fig. 4 (4).

The Rotary Range switch selects the desired test voltage: 500V, 1000V, 1500V, 2000V and 2500V for Cat. No. 218638; and 1000V, 2000V, 3000V, 4000V and 5000V for Cat. No. 218640. An extra position on the switch is labeled DISCHARGE. This position is used after a test to discharge any voltage present on the circuit under test before removing the test leads.

The scales are marked for direct reading on the lowest voltage range: multipliers for the remaining test voltages are shown at each switch position.

The infinity adjuster is a screw located on the front of the case below the level of the top plate, Fig 1. When infinity is checked and found to be incorrect, a slight turning of the adjustment screw will bring the meter pointer coincident with the infinity mark on the scale. Once set, this should not normally require re-setting.

MEASURING TERMINALS, Figure 5

The three measuring terminals are mounted on a small panel recessed into the case at the end opposite the crank handle.

The three terminals are marked L, GUARD, and E. The terminal marked L (Line) connects with the deflecting coil in the cross-coil movement. The shielded line test lead is connected to this terminal. The central terminal GUARD is connected to the generator and rectifier circuit. This test lead is designed so that any leakage current flowing in the

shield covering the Line test lead will also flow in the Guard circuit and thus be returned to the voltage source without passing through the ohmmeter.

Terminal E (Earth) connects with the voltage coil in the cross-coil movement. The Earth test lead is connected to this terminal.

NOTE: HIGH POTENTIALS EXIST AT THESE TERMINALS DURING TESTS!

LINE CONNECTION PANEL, Figure 6

This panel carries the three-position line switch. An indicator lamp and a fuse are also located here. The line cord plugs into a three-pin input connector.

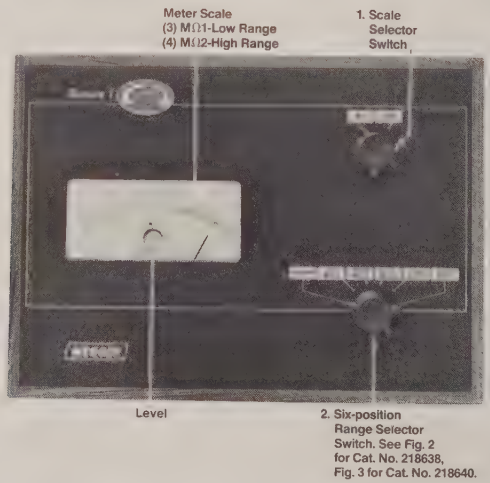

Meter Scale
(3) MΩ1-Low Range
(4) MΩ2-High Range
1. Scale Selector Switch
Level
2. Six-position Range Selector Switch. See Fig. 2 for Cat. No. 218638, Fig. 3 for Cat. No. 218640.

Figure 4: Panel arrangement of the Cat. No. 218638 Heavy-Duty Megger tester.

Figure 5: The Measuring Terminals.

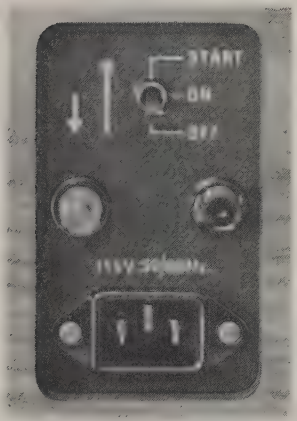


Figure 6: Line Connection Panel.

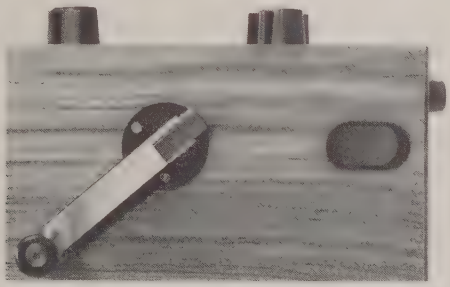


Figure 7: Details of the hand crank.

Section G

SETTING UP

POSITIONING THE INSTRUMENT

Place the instrument on a firm, reasonably level base and remove the cover to expose the instrument scale plate. A circular spirit level (Fig. 4) will be seen. Adjust the three screw feet on the base of the instrument until the bubble is centered in the spirit level. The instrument is now ready to operate.

INFINITY ADJUSTMENTS

Before connecting the leads, turn the crank handle (Fig. 7) at a normal speed and check to see if the meter pointer indicates infinity. If necessary, adjust the infinity adjuster located on the side of the instrument case facing the operator.

CONNECTING THE TEST LEADS TO THE INSTRUMENT

After infinity adjustment, the test leads may be connected as follows:

The Earth lead connects to the E terminal.
The Line lead is connected with the spade end of the lead to the L terminal and the short pigtail lead connected to the GUARD terminal.

CHECKING THE TEST LEADS

Dress the leads so that the crocodile clips are clear of each other and any other object by at least one inch. Turn the scale selector switch to MΩ11. Turn the crank handle and observe the meter pointer. This should stand over the INFINITY mark on the scale. Should the pointer indicate less than infinity, leakage is occurring between the test leads.

With the leads still connected to the instrument, clip the leads together. Turn the scale selector switch to MΩI. Turn the crank handle and observe the meter pointer. This should now register zero on the scale. Should a reading other than zero be obtained, the test leads are suspect.

Section H

OPERATION

WARNING - HIGH VOLTAGE! Read SECTION B "Safety Precautions" First!

MAKING A TEST

Important! Before making any insulation tests, isolate, take out of service or disconnect all apparatus that will be tested and any adjacent circuit or apparatus that may induce any voltage into the circuit under test. Apply safety grounds before handling these items.

CONNECTING TEST LEADS TO CIRCUIT UNDER TEST

Tests to Earth:

(a) Connect the LINE lead to the conductor or similar part of the apparatus under test.

(b) Connect the EARTH lead to the case, sheathing or frame of the apparatus under test.

NOTE: DO NOT REVERSE!

Tests Between Conductors: (a) Connect one test lead to each conductor.

SELECTION OF OPERATING MODE

Two modes of operation are available, hand cranking the generator or using the ac motor to drive the generator. Should no ac be available, then the hand crank must be used. On the other hand, when a long test sequence is planned such as measuring an insulator subject to dielectric absorption, it is advisable to use the motor drive.

THE INSULATION TEST

(a) Using the hand generator:

Select the test voltage required and connect the instrument as described earlier.

Crank the generator at about 160 rpm. The value of the insulation resistance may then be read from the instrument scale.

The Range Selector Switch should then be turned to DISCHARGE before disconnecting the test leads.

(b) Using the motor:

Plug the supply lead into the connector at the rear of the instrument. Select the test voltage required. Switch the motor to "ON" by first moving the switch lever to the "START" position. Keep the lever there until the motor reaches full running speed. Then release the lever. The switch will move to the "ON" position. Read the value of insulation resistance as shown on the instrument scale. When the test has been completed turn off the motor by returning the switch to the "OFF" position.

CAPACITANCE DISCHARGE

Before disconnecting the test leads, set the Range Selector Switch to DISCHARGE. Allow a period of time to elapse before disconnecting the leads. For most applications this period should be about five times the length of time the insulation was energized. (See Section B Safety Precautions.)

It is extremely important that circuits involving capacitance and dangerously high voltages be discharged at the end of a test. This must be done BEFORE THE TEST LEADS ARE REMOVED, otherwise test personnel will be endangered. As an extra precaution when making such tests, it is recommended that rubber gloves be worn.

If convenient, a safety ground connection can be connected in parallel with the test leads after the instrument is switched to DISCHARGE and before the leads are disconnected. The leads may then be safely disconnected provided that this safety ground connections is not disturbed.

Section I

APPLICATION NOTES

The Series 1 Megger tester may be used for performing insulation resistance measurements on a variety of components such as motors, generators, transformers, high voltage insulators, power cables and wiring installations. General Application Notes are contained in Instruction/Application Manual 21-P-8 supplied with this instrument.

The tester can also be employed to make measurements designed to show the gradual decline that takes place in insulation when attacked by corrosion, dirt, grease, moisture, etc. during the operational life of a particular installation. Such monitoring enables the Maintenance Engineer to anticipate future performance and to plan ahead for repairs.

The Megger tester will also show improvements in the insulation of motor, transformer and generator windings that result from drying out procedures used after exposure to excessive humidity or water.

Insulation testers are prime tools for initial inspection and establishing a life maintenance program for electrical wiring and equipment. The Biddle manual 21-P-8 entitled "A Stitch in Time" discusses in detail the various uses of Megger Insulation Testers. A copy is furnished with each instrument at time of shipment. For training purposes, an audio-visual version of "A Stitch in Time" is available for rent or purchase. Contact the factory or your nearest Biddle Representative for details.

Section J

PARTS LIST

SYMBOL	ITEM	Catalog Number 218638 (SL)	218640 (SH)
S1	Power Switch	12119-19	12119-19
S2	Scale Switch	10388-1	10388-1
S3	Range Switch	10388-2	10388-2
	Movement (Calibrated)	10388-7	10388-8
	Knob Cap	10388-5	10388-5
	Knob	10388-9	10388-9
	Foot Cover (bottom)	3140	3140
	Rubber Foot (back)	2817	2817
	Crank Handle Assembly	10388-10	10388-10
	Capacitor Board Assy. 120V	10388-11	10388-13
	Capacitor Board Assy. 240V	10388-12	10388-14
	Voltage Multiplier Board Assy.	-	10388-15
	Component Board Assembly	10388-16	10388-17
	Resistor Board Assembly	10388-19	10388-20
	Amplifier Assembly	10388-18	10388-18
	Terminals	10388-21	10388-21
	Terminal Disc "E"	10388-22	10388-22
	Terminal Disc "L"	10388-23	10388-23
	Terminal "Guard"	10388-24	10388-24
	Window	10388-25	10388-25
	Fuse Holder	10388-3	10388-3
	Foot Assembly	10388-4	10388-4
	Input Receptacle	10388-6	10388-6
		120V	240V
	Lamp	10388-26	10388-27
	Fuse (20 x 5 mm)	2544-3 (2A)	2544-2 (1A)
	Motor 50/60 Hz	10388-28	10388-29
	Supply Cord	17032	17032-2

PARTS LIST (Cont'd.)

COMPONENT IDENTIFICATION

Symbol	Value
CAPACITOR BOARD ASSEMBLY 120V, 50/60 Hz	10388-1
C1,C2,C3,C4,C5,C6,C7,C8	2.2μF, 250V dc
C14,C15,C16,C17,C21,C22	0.47μF, 10% 1kV dc
C23,C24,C25	0.01μF, 20% 4kV dc
C26	0.22μF, 10%, 2.5kV
D1,D2,D3,D4	5AV20
R1,R2	100KΩ or 91KΩ or 82KΩ selected at assembly.
R14	10KΩ, 2%, 2W
CAPACITOR BOARD ASSEMBLY 240V, 50/60 Hz	10388-12
C9,C10,C11,C12,C13	1μF, 5%, 250V ac
C14,C15,C16,C17,C21,C22	0.47μF, 10% 1kV dc
C23,C24,C25	0.01μF, 20%, 4kV dc
D1,D2,D3,D4	5AV20
R1,R2	100KΩ or 91KΩ or 82KΩ selected at assembly.
R14	16KΩ, 2%, 2W
CAPACITOR BOARD 120V 50/60 Hz	10388-13
C1,C2,C3,C4,C5,C6,C7,C8	2.2μF, 5%, 250V dc
CAPACITOR BOARD 240V 50/60 Hz	10388-14
C9,C10,C11,C12,C13	1μF, 10%, 250V ac
VOLTAGE MULTIPLIER BOARD	10388-15
C14,C15,C16,C17	0.22μF, 10%, 2.5kV dc
C21,C22,C23	Selected at assembly.
D1,D2,D3,D4	5AV40
R1,R2	10KΩ, 2%, 1W
R14,R15,R16	Selected at assembly.

Section J

PARTS LIST (Cont'd.)

COMPONENT IDENTIFICATION

Symbol	Value
COMPONENT BOARD ASSEMBLY	10388-16
C18	0.068μF, 10%, 400V
C19	1000μF, 16V
C20	0.01μF, 10%, 400V
C24	22μF, 35V
C27	22μF, 35V
C28	.1μF, 10%, 160V
D5	ISB05
R19,R20,R21	1MΩ, 2%, 1/2W
R22	1KΩ, 2%, 1/2W
R23	2.4KΩ, 2%, 1/2W
R24	24KΩ, 2%, 1/2W
R25	390KΩ, 2%, 1/2W
R26	5.6KΩ, 2%, 1/2W
R27	13KΩ, 1/2%, 1W
RV1,RV2	2.2KΩ, 20%, 1W
TR1,TR2	BC214
TR3,TR4,TR5,TR6	BC184
COMPONENT BOARD ASSEMBLY	10388-17
C18	0.68μF, 10%, 400V
C19	1000μF, 16V
C20	0.01μF, 10%, 400V
C24	22μF, 35V
C25	0.1μF, 10%, 160V
D5	VM25
R19,R20,R21	1MΩ, 2%, 1/2W
R22	1KΩ, 2%, 1/2W
R23	2.4KΩ, 2%, 1/2W
R24	9.1KΩ, 2%, 1/2W
R25	15KΩ, 2%, 1/2W

PARTS LIST (Cont'd.)

COMPONENT IDENTIFICATION

Symbol	Value
COMPONENT BOARD ASSEMBLY (Cont'd.)	10388-17
R26	5.6KΩ, 2%, 1/2W Nominally
R27	91KΩ, .1%, 1/2W
RV1	2.2KΩ, 20%, 1W
RV2	10KΩ, 20%, 1W
TR1,TR2	BC214
TR3,TR4,TR5,TR6	BC184
AMPLIFIER ASSEMBLY	10388-18
C1	0.01μF, 400V
D1	-
R1	510Ω, 5%, 1/2W
R2	390KΩ, 1%, 1/2W
R3	820Ω, 2%, 1/4W
R4	820Ω, 5%, 1/2W
R5	220Ω, 5%, 1/4W
R6	47Ω, 2%, 1/4W
R7	220Ω, 5%, 1/4W
RV1	1KΩ
T1	2N930
IC1	RCA CA3046
RESISTOR BOARD ASSEMBLY	10388-19
R3	29KΩ, 0.1%, 1W
R4	330KΩ, 0.1%, 1W
R5,R6,R7,R8	360KΩ, 0.1%, 1W
R9,R10,R11,R12	20KΩ, 0.1%, 1W
RESISTOR BOARD ASSEMBLY	10388-20
R3,R4	91KΩ, 0.1%, .65W
R5	9.26KΩ, 0.1%, .65W
R6,R7,R8,R9	1.11MΩ, 0.1%, 1.3W
R10,R11,R12,R13	100KΩ, 0.1%, .65W
D6,D7	5AV40

Section K

WARRANTY AND REPAIRS

WARRANTY

All products supplied by the James G. Biddle Co. are warranted against all defects in material and workmanship for a period of one year following shipment. Our liability is specifically limited to replacing or repairing, at our option, defective equipment. Equipment returned to the factory for repair will be shipped Prepaid and Insured. The warranty does not include batteries, lamps or tubes, where the original manufacturer's warranty shall apply. WE MAKE NO OTHER WARRANTY.

The warranty is void in the event of abuse.

REPAIRS

The James G. Biddle Co. maintains a complete instrument repair service. Should this instrument ever require repairs, we recommend it be returned to the factory for repair by our instrument specialists. When returning instruments for repairs, either in or out of warranty, they should be shipped Prepaid and Insured, and marked for the attention of the Instrument Service Manager.

Section L

ACCESSORIES

The following accessories are available from the James G. Biddle Co.:

TEST LEADS: (Fig. 8)

Catalog No.	Description
210699-7	25' Grounded High Voltage Test Leads.
210699-8	50' Grounded High Voltage Test Leads.
210964	25' Insulated Ground Test Lead.
210965	50' Insulated Ground Test Lead.

CARRYING CASE: (Fig. 9)

210744	Re-usable storage shipping case.

TEST RECORD CARD: (Fig. 10)

210959	Card.

Figure 8: Testing Leads.

Figure 9: Carrying Case.

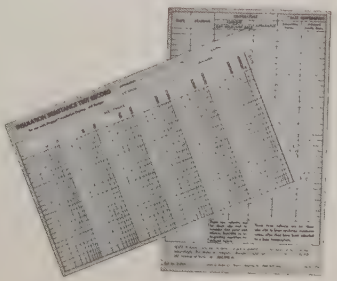


Figure 10: Test Record Card.

Figure 1: The Series 1 Heavy-Duty Megger(R) Insulation Tester.

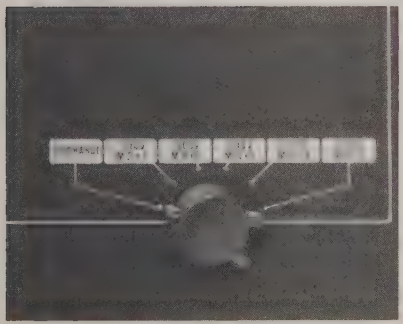
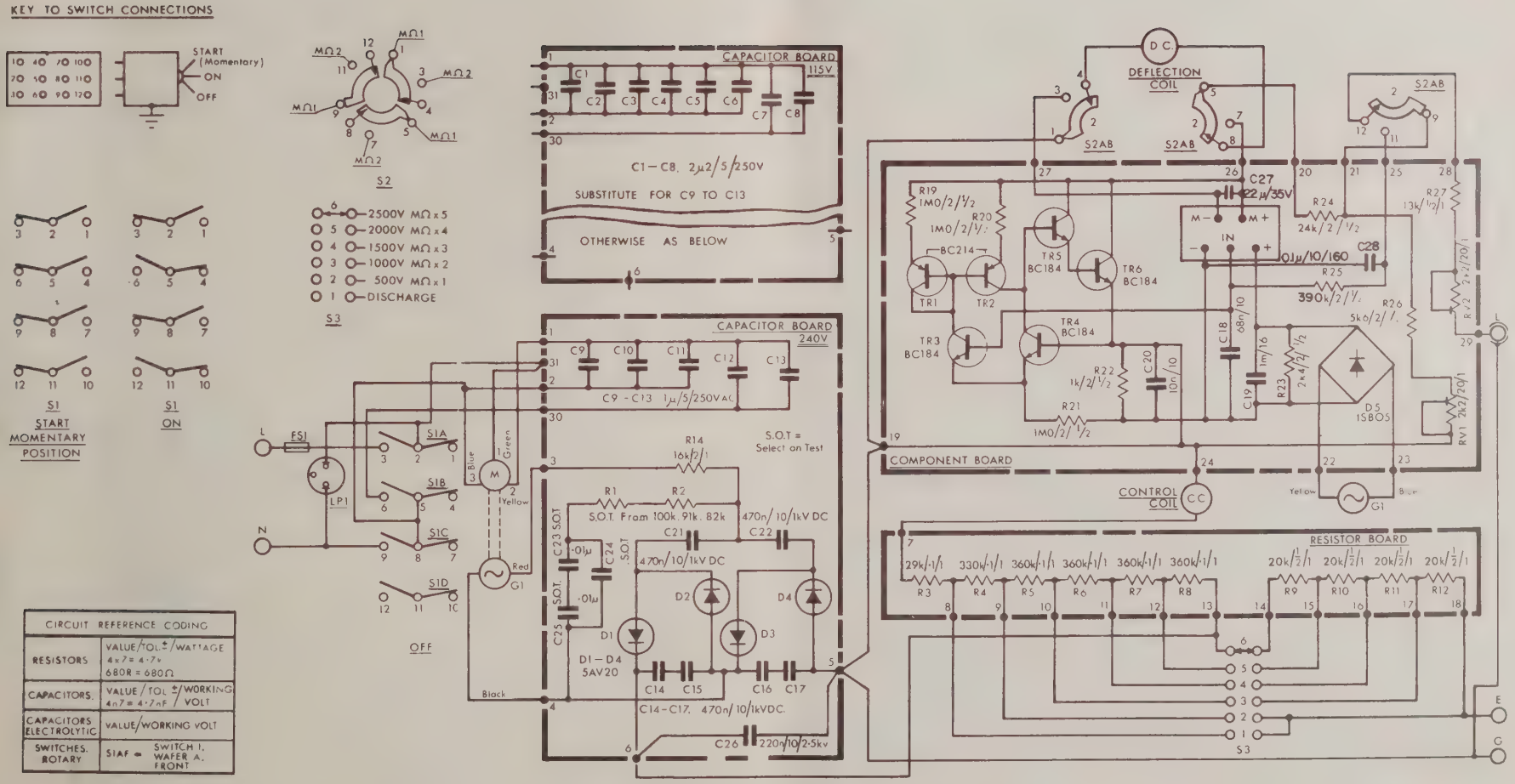


Figure 2: Cat. No. 218638
Range Switch.

Figure 3: Cat. No. 218640
Range Switch.



CIRCUIT REFERENCE CODING	
RESISTORS	VALUE/TOL.±/WATTAGE 4k7 = 4·7k 680R = 680Ω
CAPACITORS	VALUE/TOL ±/WORKING VOLT 4n7 = 4·7nF
CAPACITORS ELECTROLYTIC	VALUE/WORKING VOLT
SWITCHES. ROTARY	S1AF = SWITCH 1, WAFER A, FRONT

Figure 11: Schematic Drawing of Cat. No. 218638 Heavy-Duty Megger Insulation Tester.

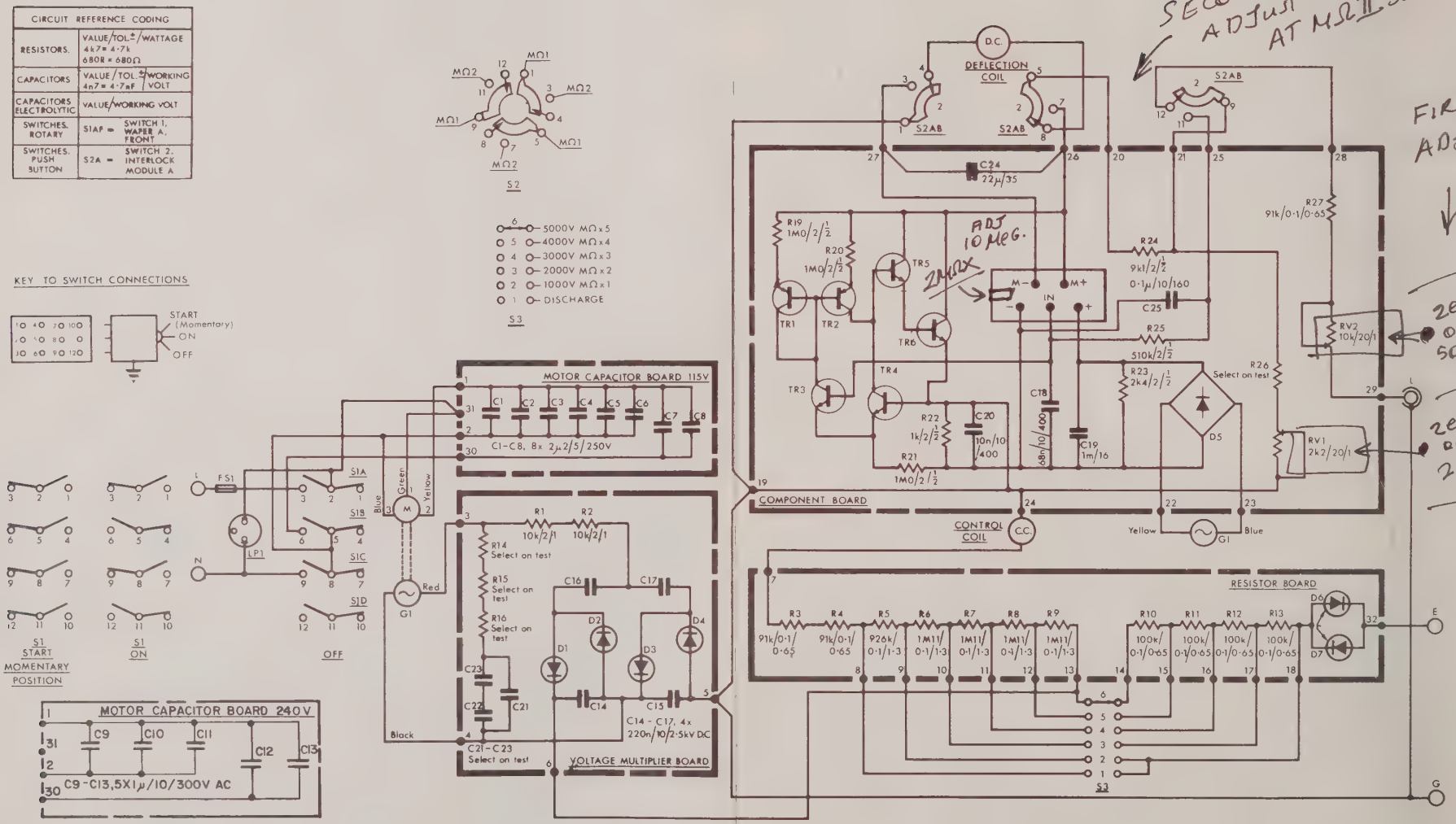


Figure 12: Schematic Drawing of Cat. No. 218640
Heavy-Duty Megger Insulation Tester.

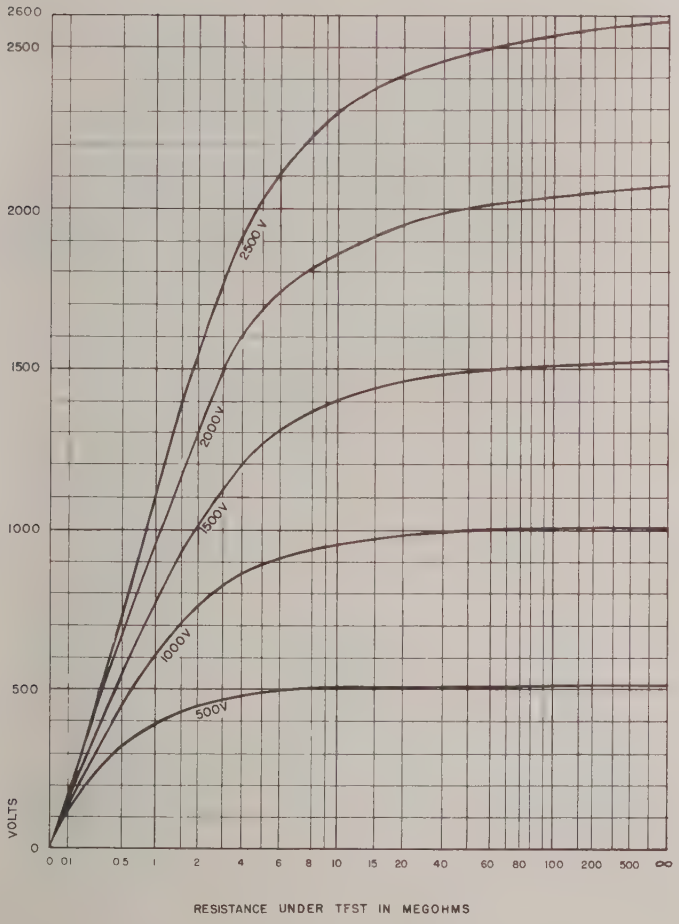


Figure 13: Voltage Characteristic Curves of Cat. No. 218638.

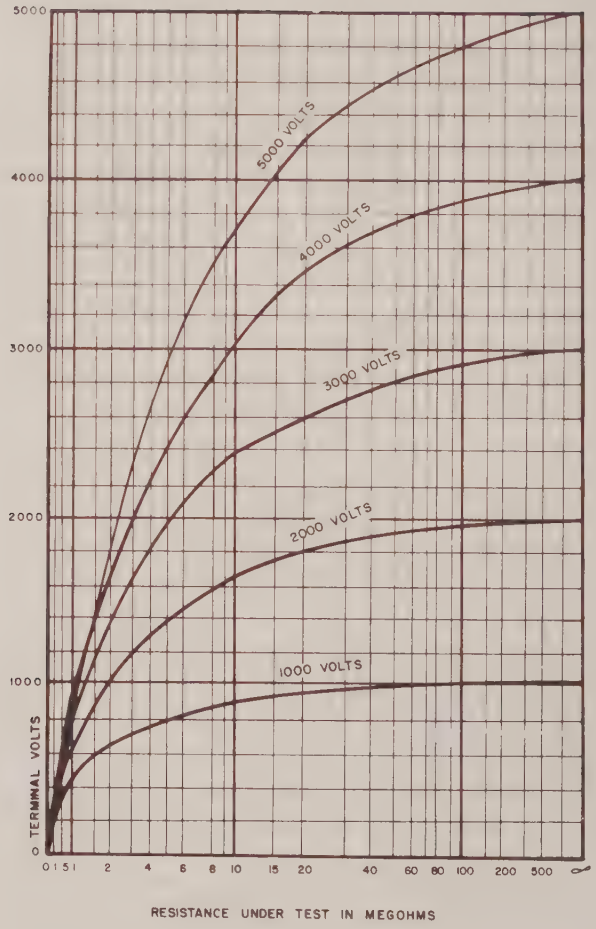


Figure 14: Voltage Characteristic Curves of Cat. No. 218640.

Catalog No. 218638

Figure 15: Reduced Facsimile Scale of Cat. No. 218638.

Catalog No. 218640

Figure 16: Reduced Facsimile Scale of Cat. No. 218640.

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